Genetic manipulations in the rat: progress and prospects.

Journal:	Curr Opin Nephrol Hypertens
Publication Year:	2011
Authors:	Guanyi Huang, Charles Ashton, Dhruv S Kumbhani, Qi-Long Ying
PubMed link:	21546835
Funding Grants:	CIRM Stem Cell Biology Training Program

Public Summary:

Several advances have been made to manipulate the rat genome in the last 2 years. This review aims to describe these advances in rat genetic manipulations, with an emphasis on their current status and their prospects and applications in the postgenomic era.The rat has long been a prime model organism in physiological, pharmacological and neurobehavioral studies. The recent advances of rat reverse genetic approaches, together with the classical ENU and transposon mutagenesis system, will contribute tremendously to the deciphering of gene functions and the creation of rat disease models.

Scientific Abstract:

PURPOSE OF REVIEW: Several advances have been made to manipulate the rat genome in the last 2 years. This review aims to describe these advances in rat genetic manipulations, with an emphasis on their current status and their prospects and applications in the postgenomic era. RECENT FINDINGS: Authentic rat embryonic stem cells were derived in 2008 using the 2i/3i culture system. This led to the generation of the first gene knockout rats via embryonic stem cell-based gene targeting. The development of zinc-finger nucleases (ZFNs) provided an alternative approach that avoids the necessity of germline competent embryonic stem cells. Meanwhile, improvements have been made to the well established random mutagenesis mediated by transposons or N-ethyl-N-nitrosourea (ENU). The in-vitro rat spermatogonial stem cell (SSC) system has greatly optimized these phenotype-driven approaches for future applications. SUMMARY: The rat has long been a prime model organism in physiological, pharmacological and neurobehavioral studies. The recent advances of rat reverse genetic approaches, together with the classical ENU and transposon mutagenesis system, will contribute tremendously to the deciphering of gene functions and the creation of rat disease models.

Source URL: https://www.cirm.ca.gov/about-cirm/publications/genetic-manipulations-rat-progress-and-prospects